

## PCT

PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>P/61459/MRCY</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/GB 99/ 03642</b>	International filing date (day/month/year) <b>04/11/1999</b>	(Earliest) Priority Date (day/month/year) <b>07/11/1998</b>
Applicant <b>MARCONI ELECTRONIC SYSTEMS LIMITED et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

## 4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

## 5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

## 6. The figure of the drawings to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1  
☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/03642

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06K19/07 G01S7/35 G01S13/76

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06K G01S H03D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 786 903 A (GRINDAHL MERVIN L ET AL) 22 November 1988 (1988-11-22) abstract column 2, line 12 -column 4, line 68 figures 1,2	1,4-6,9, 10,12
X	GB 2 284 323 A (MARCONI GEC LTD) 31 May 1995 (1995-05-31) cited in the application	1,5,6,9, 10,12
A	abstract page 1, line 1 -page 3, line 20 page 5, line 15 -page 6, line 9 figures 1,3,4	2-4
	— -/-	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the International filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the International filing date but later than the priority date claimed

"T" later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"Z" document member of the same patent family

Date of the actual completion of the International search

7 February 2000

Date of mailing of the International search report

15/02/2000

Name and mailing address of the ISA

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Authorized officer

Jacobs, P

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/03642

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 871 042 A (GORDIAN HOLDING CORP) 14 October 1998 (1998-10-14) abstract column 1, line 3 -column 4, line 18	7,8
A	US 3 983 487 A (OHNO MASA HARU) 28 September 1976 (1976-09-28) abstract	11
A	EP 0 467 036 A (SAVI TECHN INC) 22 January 1992 (1992-01-22) abstract column 3, line 35 -column 6, line 46	12

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/03642

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4786903	A	22-11-1988	NONE	
GB 2284323	A	31-05-1995	AU 1113595 A WO 9515500 A US 5822685 A	19-06-1995 08-06-1995 13-10-1998
EP 0871042	A	14-10-1998	US 5204681 A EP 0960961 A AT 174436 T AU 679672 B AU 2809192 A CA 2119774 A,C DE 69227839 D DE 69227839 T EP 0605650 A ES 2127763 T FI 941351 A GR 3029615 T IL 103259 A IL 113607 A NO 941048 A NO 962295 A NO 962296 A WO 9306504 A US 5581257 A US 5891240 A US 5291205 A	20-04-1993 01-12-1999 15-12-1998 10-07-1997 27-04-1993 01-04-1993 21-01-1999 10-06-1999 13-07-1994 01-05-1999 09-05-1994 30-06-1999 14-05-1996 16-10-1996 10-05-1994 10-05-1994 10-05-1994 01-04-1993 03-12-1996 06-04-1999 01-03-1994
US 3983487	A	28-09-1976	JP 1236846 C JP 51020661 A JP 59006524 B CA 1045209 A DE 2536347 A FR 2282187 A GB 1495184 A NL 7509616 A	31-10-1984 19-02-1976 13-02-1984 26-12-1978 26-02-1976 12-03-1976 14-12-1977 17-02-1976
EP 0467036	A	22-01-1992	AT 134044 T DE 69116946 D DE 69116946 T DK 467036 T ES 2082885 T GR 3019842 T JP 4232488 A US 5640151 A US 5528232 A US 5686902 A US 5973613 A	15-02-1996 21-03-1996 20-06-1996 11-03-1996 01-04-1996 31-08-1996 20-08-1992 17-06-1997 18-06-1996 11-11-1997 26-10-1999

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference P/61459/MRCY	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB99/03642	International filing date (day/month/year) 04/11/1999	Priority date (day/month/year) 07/11/1998
International Patent Classification (IPC) or national classification and IPC G06K19/07		
Applicant MARCONI ELECTRONIC SYSTEMS LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  02/06/2000	Date of completion of this report  1 2. 02. 01
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Geiger, J-W  Telephone No. +49 89 2399 2584  

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/03642

## I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

### Description, pages:

1,2,5-11	as originally filed			
3,3a,4	as received on	08/12/2000	with letter of	04/12/2000

### Claims, No.:

12	as originally filed			
1-11	as received on	08/12/2000	with letter of	04/12/2000

### Drawings, sheets:

1/2,2/2	as originally filed
---------	---------------------

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/03642

4. The amendments have resulted in the cancellation of:

- ☐ the description,      pages:
- ☐ the claims,      Nos.:
- ☐ the drawings,      sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-12;
	No: Claims
Inventive step (IS)	Yes: Claims 1-12;
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-12;
	No: Claims

2. Citations and explanations  
**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

Reference is made to the following documents:

D1: US-A-4 786 903

D2: GB-A-2 284 323

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

- 1.) The present invention relates to a receiver circuit for receiving a modulated carrier signal used as a "wake-up" for a tag. This circuit comprises an antenna, a transistor, a resonator circuit, and an oscillator quenching means for the sensing of build-up oscillation to indicate the presence of a modulated carrier signal.
- 2.) D1 discloses (the references in parentheses applying to this document)  
a receiver circuit comprising
  - ◆ an antenna (cf. fig. 1, part 36; and col. 3, lines 15 - 20) for receiving a modulated carrier signal;
  - ◆ a transistor (34) connected to the antenna and configured to operate as a detector of modulation of the carrier signal (cf. col. 3, lines 49 - 68);
  - ◆ a resonator circuit (parts 36 - 42) connected to the transistor;
  - ◆ an oscillator quenching means (22) for periodically quenching oscillation of the transistor (cf. col. 3, lines 40 - 48) and means (14, 16) for sensing the characteristics of the build-up of oscillation to indicate the presence of a modulated carrier signal (cf. col. 3, line 66 to col. 4, line 26).

The subject-matter of claim 1 differs from the receiver circuit of D1 in that the transistor simultaneously self-oscillates at substantially the **modulation frequency**. By controlling the frequency of the quenching oscillation of the transistor, the presence of a **modulated** carrier signal can be detected.

The transistor of the receiver circuit according to D1 oscillates substantially at the **carrier frequency** superposed by the modulation frequency. The detection of the



modulation signal in D1 is achieved by sampling the self-oscillation signal of the transistor being a superposition of the carrier and the modulation signal.

D2 discloses a receiver circuit operating as a super regenerative receiver. The subject-matter of D2 differs from the one of claim 1 in that the transistor is not self-oscillating at the modulation frequency. The transistor of the receiver according to D2 oscillates at the frequency of the incoming signal which can be an unmodulated carrier signal or the superposition of a carrier and a modulation signal. Thereby the receiver according to D2 will differ from the one of the present invention in that it will not distinguish between an unmodulated carrier signal or a modulated carrier signal.

Hence, neither D1 nor D2 suggest alone or in combination to configure the receiver circuit such that the transistor (of the receiver stage) simultaneously self-oscillates at substantially the **modulation frequency**.

Since the available prior art documents neither disclose nor give a hint to the subject-matter of claim 1 the subject-matter of claim 1 meets the requirements of PCT in accordance with novelty and inventive step (Article 33(2)(3)).

- 3.) Claims 2 - 11 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step (Article 33(2)(3) PCT).
- 4.) Since claim 12 comprises all the features of claim 1, the subject-matter of claim 12 as such also meets the requirements of Article 33(2)(3) PCT.

#### **Re Item VII**

##### **Certain defects in the international application**

Although claim 1 is drafted in the two-part form the features of an oscillator quenching means for periodically quenching oscillation of the transistor and means for sensing the characteristics of the build-up of oscillation are incorrectly placed in the characterising portion, as they are disclosed in document D1 and D2 resp. in combination with the features placed in the preamble (Rule 6.3(b) PCT).

The use of wake-up detectors is also known in applications other than tagging systems such as for example in the handsets of cellular telephones or in digital cordless telephones. Whilst for such applications cost is not such an overriding issue an inexpensive detector receiver circuit could be of benefit. A need exists therefore for a receiver circuit which is both inexpensive and which has a low power consumption.

US 4786903 discloses a radio frequency transponder which comprises a single tuned amplifier which is configured to operate as an oscillator at the intended carrier frequency in receive and transmit modes. In the receive mode, oscillation of the amplifier is externally quenched and the circuit operates as a super-regenerative receiver at the carrier frequency. In a transmit mode the circuit oscillates at the carrier frequency to radiate a transmitted signal.

GB 2284323 discloses a transponder circuit which is based upon a single field effect transistor and which is switched between modes by changing the drain source current. At lower currents within the non-linear relatively low gain region of the transistor's current voltage characteristic, the transistor operates to detect an amplitude modulated signal applied to the transistor. A feedback arrangement is provided such that when the transistor is operated in a linear relatively higher current and gain region of its characteristic it operates as a negative impedance amplifier and will reflect and amplify a signal applied to it. In a third mode of operation, at a yet higher current and gain, the transistor is configured to operate as a super-regenerative receiver and self-oscillates at the carrier frequency with oscillation of the transistor being periodically quenched.

3a

The present invention has arisen in an endeavour to provide a receiver circuit which can be used as a wake-up detector and which at least in part overcomes the problems of the known arrangements.

- 5 According to the present invention a receiver circuit comprises: an antenna for receiving a modulated carrier signal and a transistor connected to the antenna and configured to operate as a detector of modulation of the carrier signal; characterised by a resonator circuit connected to the transistor and configured such that the transistor can simultaneously self-oscillate at substantially the modulation frequency; an oscillator  
10 quenching means for periodically quenching self-oscillation of the transistor and means for sensing the characteristics of the build-up of oscillation to indicate the presence of the modulated carrier signal.

- How quickly the magnitude of oscillation of the transistor builds up is determined by  
15 whether the antenna is receiving a carrier signal which is modulated at the selected modulation frequency. It will be appreciated therefore that the transistor simultaneously operates as a detector of the modulation of the carrier and as a super-regenerative receiver at the modulation frequency of this carrier. By configuring the transistor to simultaneously operate in the two modes of operation at the lower modulation frequency,  
20 as opposed to the carrier frequency, this ensures that the circuit has a very low power consumption and yet is still extremely sensitive.

In one arrangement of the circuit, the oscillator quenching means quenches oscillation of

the transistor when the magnitude of oscillation reaches a selected magnitude and the means for sensing measures the time between quenching of the transistor to indicate the presence of the modulated carrier signal. For example, when the circuit receives a carrier signal modulated at, or substantially the same as, the frequency of self-oscillation of the circuit, the time taken to reach the selected magnitude will decrease and this can be detected as an increase in the quenching frequency. Preferably the selected magnitude is the point at which oscillator compression of the transistor occurs, that is the point at which saturation of the amplitude of the oscillation of the transistor occurs.

In an alternative embodiment, the oscillator quenching means quenches oscillation of the transistor at regular time intervals and the means for sensing measures the magnitude of oscillation over one or more of the time intervals to indicate the presence of the modulated carrier signal. Conveniently the time interval is selected such that in the absence of a modulated signal the magnitude of oscillation will not reach a selected threshold value and will exceed this threshold when a modulated carrier signal is present. Alternatively the average magnitude of oscillation over one or more time intervals can be used to indicate the presence of a modulated carrier signal.

In a particularly preferred embodiment, which is for use at microwave frequencies, the transistor comprises a field effect transistor (FET) and the oscillator quenching means,

CLAIMS

1. A receiver circuit (2) comprising: an antenna (4) for receiving a modulated carrier signal and a transistor (10) connected to the antenna and configured to operate as a detector of modulation of the carrier signal; characterised by a resonator circuit (12-16) connected to the transistor and configured such that the transistor simultaneously self-oscillates at substantially the modulation frequency; an oscillator quenching means (20) for periodically quenching oscillation of the transistor and means (26, 28, 30) for sensing the characteristics of the build-up of oscillation to indicate the presence of the modulated carrier signal.
2. A receiver circuit according to Claim 1 in which the oscillator quenching means (20) quenches oscillation of the transistor when the magnitude of oscillation reaches a selected magnitude and the means for sensing measures the time between quenching of the transistor to indicate the presence of the modulated carrier signal.
3. A receiver circuit according to Claim 2 in which the selected magnitude is the point at which oscillator compression of the transistor occurs.
4. A receiver circuit according to Claim 1 in which the oscillator quenching means quenches oscillation of the transistor at regular time intervals, and the means for sensing measures the magnitude of oscillation over one or more of the time intervals to indicate the presence of the modulated carrier signal.


5. A receiver circuit according to any preceding claim wherein the transistor comprises a field effect transistor (FET).
6. A receiver circuit according to Claim 5 wherein the oscillator quenching means quenches oscillation of the transistor by varying the drain source current.
7. A receiver circuit according to any preceding claim in which the resonator circuit comprises a ceramic resonator.
8. A detector receiver circuit according to any one of Claims 1 to 6 in which the resonator circuit comprises a quartz crystal.
9. A detector receiver circuit according to any one of Claims 1 to 6 in which the resonator circuit comprises a network of one or more capacitors and inductors.
10. A receiver circuit according to any preceding claim and further comprising a matching network between the antenna and transistor.
11. A receiver circuit according to any preceding claim for use with a frequency or phase modulated carrier signal and further comprising a narrow band filter for converting the frequency or phase modulated signal to an amplitude modulated signal before it is applied to the input of the transistor.

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P/61459/MRCY		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB99/03642	International filing date (day/month/year) 04/11/1999	Priority date (day/month/year) 07/11/1998	
International Patent Classification (IPC) or national classification and IPC G06K19/07			
Applicant MARCONI ELECTRONIC SYSTEMS LIMITED et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 5 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the report</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input checked="" type="checkbox"/> Certain defects in the international application</li> <li>VIII <input type="checkbox"/> Certain observations on the international application</li> </ul>			
Date of submission of the demand  02/06/2000		Date of completion of this report  1 2. 02. 01	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer  Geiger, J-W  Telephone No. +49 89 2399 2584	



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/03642

## I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:

### Description, pages:

1,2,5-11	as originally filed		
3,3a,4	as received on	08/12/2000	with letter of 04/12/2000

### Claims, No.:

12	as originally filed		
1-11	as received on	08/12/2000	with letter of 04/12/2000

### Drawings, sheets:

1/2,2/2	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB99/03642

4. The amendments have resulted in the cancellation of:

- ☐ the description,      pages:
- ☐ the claims,      Nos.:
- ☐ the drawings,      sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims 1-12;
	No:	Claims
Inventive step (IS)	Yes:	Claims 1-12;
	No:	Claims
Industrial applicability (IA)	Yes:	Claims 1-12;
	No:	Claims

**2. Citations and explanations**  
**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB99/03642

Reference is made to the following documents:

D1: US-A-4 786 903

D2: GB-A-2 284 323

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

- 1.) The present invention relates to a receiver circuit for receiving a modulated carrier signal used as a "wake-up" for a tag. This circuit comprises an antenna, a transistor, a resonator circuit, and an oscillator quenching means for the sensing of build-up oscillation to indicate the presence of a modulated carrier signal.
- 2.) D1 discloses (the references in parentheses applying to this document) a receiver circuit comprising
  - ♦ an antenna (cf. fig. 1, part 36; and col. 3, lines 15 - 20) for receiving a modulated carrier signal;
  - ♦ a transistor (34) connected to the antenna and configured to operate as a detector of modulation of the carrier signal (cf. col. 3, lines 49 - 68);
  - ♦ a resonator circuit (parts 36 - 42) connected to the transistor;
  - ♦ an oscillator quenching means (22) for periodically quenching oscillation of the transistor (cf. col. 3, lines 40 - 48) and means (14, 16) for sensing the characteristics of the build-up of oscillation to indicate the presence of a modulated carrier signal (cf. col. 3, line 66 to col. 4, line 26).

The subject-matter of claim 1 differs from the receiver circuit of D1 in that the transistor simultaneously self-oscillates at substantially the **modulation frequency**. By controlling the frequency of the quenching oscillation of the transistor, the presence of a **modulated** carrier signal can be detected.

The transistor of the receiver circuit according to D1 oscillates substantially at the **carrier frequency** superposed by the modulation frequency. The detection of the

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB99/03642

modulation signal in D1 is achieved by sampling the self-oscillation signal of the transistor being a superposition of the carrier and the modulation signal.

D2 discloses a receiver circuit operating as a super regenerative receiver. The subject-matter of D2 differs from the one of claim 1 in that the transistor is not self-oscillating at the modulation frequency. The transistor of the receiver according to D2 oscillates at the frequency of the incoming signal which can be an unmodulated carrier signal or the superposition of a carrier and a modulation signal. Thereby the receiver according to D2 will differ from the one of the present invention in that it will not distinguish between an unmodulated carrier signal or a modulated carrier signal.

Hence, neither D1 nor D2 suggest alone or in combination to configure the receiver circuit such that the transistor (of the receiver stage) simultaneously self-oscillates at substantially the **modulation frequency**.

Since the available prior art documents neither disclose nor give a hint to the subject-matter of claim 1 the subject-matter of claim 1 meets the requirements of PCT in accordance with novelty and inventive step (Article 33(2)(3)).

- 3.) Claims 2 - 11 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step (Article 33(2)(3) PCT).
- 4.) Since claim 12 comprises all the features of claim 1, the subject-matter of claim 12 as such also meets the requirements of Article 33(2)(3) PCT.

**Re Item VII:**

**Certain defects in the international application**

Although claim 1 is drafted in the two-part form the features of an oscillator quenching means for periodically quenching oscillation of the transistor and means for sensing the characteristics of the build-up of oscillation are incorrectly placed in the characterising portion, as they are disclosed in document D1 and D2 resp. in combination with the features placed in the preamble (Rule 6.3(b) PCT).

The use of wake-up detectors is also known in applications other than tagging systems such as for example in the handsets of cellular telephones or in digital cordless telephones. Whilst for such applications cost is not such an overriding issue an inexpensive detector receiver circuit could be of benefit. A need exists therefore for a  
5 receiver circuit which is both inexpensive and which has a low power consumption.

The present invention has arisen in an endeavour to provide a receiver circuit which can be used as a wake-up detector and which at least in part overcomes the problems of the known arrangements.

10

According to the present invention a receiver circuit comprises: an antenna for receiving a modulated carrier signal; a transistor connected to the antenna and configured to operate as a detector of modulation of the carrier signal; a resonator circuit connected to the transistor and configured such that the transistor can simultaneously self-oscillate  
15 at substantially the modulation frequency; an oscillator quenching means for periodically quenching self-oscillation of the transistor and means for sensing the characteristics of the build-up of oscillation to indicate the presence of a modulated carrier signal.

20

How quickly the magnitude of oscillation of the transistor builds up is determined by whether the antenna is receiving a carrier signal which is modulated at the selected modulation frequency. It will be appreciated therefore that the transistor simultaneously operates as a detector of the modulation of the carrier and as a super-regenerative receiver at the modulation frequency of this carrier. By configuring the transistor to simultaneously operate in the two modes of operation, the circuit thus provides an

extremely sensitive receiver circuit which is both inexpensive and has a very low power consumption.

In one arrangement of the circuit, the oscillator quenching means quenches oscillation  
5 of the transistor when the magnitude of oscillation reaches a selected magnitude and the  
means for sensing measures the time between quenching of the transistor to indicate the  
presence of a modulated carrier signal. For example, when the circuit receives a carrier  
signal modulated at, or substantially the same as, the frequency of self-oscillation of the  
circuit, the time taken to reach the selected magnitude will decrease and this can be  
10 detected as an increase in the quenching frequency. Preferably the selected magnitude  
is the point at which oscillator compression of the transistor occurs, that is the point at  
which saturation of the amplitude of the oscillation of the transistor occurs.

In an alternative embodiment, the oscillator quenching means quenches oscillation of the  
15 transistor at regular time intervals and the means for sensing measures the magnitude of  
oscillation over one or more of the time intervals to indicate the presence of a modulated  
carrier signal. Conveniently the time interval is selected such that in the absence of a  
modulated signal the magnitude of oscillation will not reach a selected threshold value  
and will exceed this threshold when a modulated carrier signal is present. Alternatively  
20 the average magnitude of oscillation over one or more time intervals can be used to  
indicate the presence of a modulated carrier signal.

In a particularly preferred embodiment, which is for use at microwave frequencies, the  
transistor comprises a field effect transistor (FET) and the oscillator quenching means,

CLAIMS

1. A receiver circuit (2) comprising:
  - an antenna (4) for receiving a modulated carrier signal;
  - a transistor (10) connected to the antenna and configured to operate as a detector of modulation of the carrier signal;
  - a resonator circuit (12-16) connected to the transistor and configured such that the transistor can simultaneously oscillate at substantially the modulation frequency;
  - an oscillator quenching means (20) for periodically quenching oscillation of the transistor and means (26, 28, 30) for sensing the characteristics of the build-up of oscillation to indicate the presence of a modulated carrier signal.
2. A receiver circuit according to Claim 1 in which the oscillator quenching means (20) quenches oscillation of the transistor when the magnitude of oscillation reaches a selected magnitude and the means for sensing measures the time between quenching of the transistor to indicate the presence of a modulated carrier signal.
3. A receiver circuit according to Claim 2 in which the selected magnitude is the point at which oscillator compression of the transistor occurs.
4. A receiver circuit according to Claim 1 in which the oscillator quenching means quenches oscillation of the transistor at regular time intervals, and the means for sensing measures the magnitude of oscillation over one or more of the time intervals to indicate

the presence of a modulated carrier signal.

5. A receiver circuit according to any preceding claim wherein the transistor comprises a field effect transistor (FET).
6. A receiver circuit according to Claim 5 wherein the oscillator quenching means quenches oscillation of the transistor by varying the drain source current.
7. A receiver circuit according to any preceding claim in which the resonator circuit comprises a ceramic resonator.
8. A detector receiver circuit according to any one of Claims 1 to 6 in which the resonator circuit comprises a quartz crystal.
9. A detector receiver circuit according to any one of Claims 1 to 6 in which the resonator circuit comprises a network of one or more capacitors and inductors.
10. A receiver circuit according to any preceding claim and further comprising a matching network between the antenna and transistor.
11. A receiver circuit according to any preceding claim for use with a frequency or phase modulated carrier signal and further comprising a narrow band filter for converting the frequency or phase modulated signal to an amplitude modulated signal before it is applied to the input of the transistor.

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year)  
20 July 2000 (20.07.00)

International application No.  
PCT/GB99/03642

Applicant's or agent's file reference  
P/61459/MRCY

International filing date (day/month/year)  
04 November 1999 (04.11.99)

Priority date (day/month/year)  
07 November 1998 (07.11.98)

Applicant

FORSTER, Ian, James

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
02 June 2000 (02.06.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Olivia RANAIVOJAONA

Telephone No.: (41-22) 338.83.38



# PATENT COOPERATION TREATY

PCT

## INFORMATION CONCERNING ELECTED OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

From the INTERNATIONAL BUREAU

To:

HOSTE, Colin, Francis  
GEC Patent Dept.  
Waterhouse Lane  
Chelmsford  
Essex CM1 2QX  
ROYAUME-UNI

KM	KM
Over	P
12	0 JUL 2000
FILE	

Date of mailing (day/month/year) 20 July 2000 (20.07.00)		IMPORTANT INFORMATION	
Applicant's or agent's file reference P/61459/MRCY			
International application No. PCT/GB99/03642	International filing date (day/month/year) 04 November 1999 (04.11.99)	Priority date (day/month/year) 07 November 1998 (07.11.98)	
Applicant MARCONI ELECTRONIC SYSTEMS LIMITED et al			

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:  
EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE  
National : AU, CA, JP, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:  
None

3. The applicant is reminded that he must enter the "national phase" before the expiration of 30 months from the priority date before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 38(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed until 31 months from the priority date for all States designated for the purposes of obtaining a European patent.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Gèneve 20, Switzerland	Authorized officer: Olivia RANAIVOJAONA
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

Form PCT/IB/332 (September 1997)

3420897

# PATENT COOPERATION TREATY

PCT/GB99/0364

PCT

## NOTIFICATION OF RECEIPT OF RECORD COPY

(PCT Rule 24.2(a))

From the INTERNATIONAL BUREAU

To:

HOSTE, Colin, Francis  
GEC Patent Dept.  
Waterhouse Lane  
Chelmsford  
Essex CM1 2QX  
ROYAUME-UNI

KM	KM
ITC	
3 DEC 1999	

Date of mailing (day/month/year) 26 November 1999 (26.11.99)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P/61459/MRCY	
	International application No. PCT/GB99/03642

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

MARCONI ELECTRONIC SYSTEMS LIMITED (for all designated States except US)  
FORSTER, Ian, James (for US)

International filing date	:	04 November 1999 (04.11.99)
Priority date(s) claimed	:	07 November 1998 (07.11.98)
Date of receipt of the record copy by the International Bureau	:	22 November 1999 (22.11.99)

List of designated Offices

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE  
National : AU, CA, JP, US

### ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase
- ☒ confirmation of precautionary designations
- ☒ requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer:  I. Britel
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

Form PCT/IB/301 (July 1998)

002978434

**INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE**

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is **20 MONTHS** from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, **30 MONTHS** from the priority date, provided that the election is made before the expiration of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. **It is the applicant's responsibility** to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.

GR and ES became bound by PCT Chapter II on 7 September 1996 and 6 September 1997, respectively, and may, therefore, be elected in a demand or a later election filed on or after 7 September 1996 and 6 September 1997, respectively, regardless of the filing date of the international application. (See second paragraph above.)

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**CONFIRMATION OF PRECAUTIONARY DESIGNATIONS**

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

**REQUIREMENTS REGARDING PRIORITY DOCUMENTS**

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity to furnish the priority document within a time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

From the INTERNATIONAL BUREAU

To:

HOSTE, Colin, Francis  
GEC Patent Dept.  
Waterhouse Lane  
Chelmsford  
Essex CM1 2QX  
ROYAUME-UNI

(PCT Rule 47.1(c), first sentence)

GREIGS	<i>de</i>
ITC.	
28 MAY 2000	

## IMPORTANT NOTICE

Date of mailing (day/month/year) 18 May 2000 (18.05.00)			
Applicant's or agent's file reference P/61459/MRCY		IMPORTANT NOTICE	
International application No. PCT/GB99/03642	International filing date (day/month/year) 04 November 1999 (04.11.99)	Priority date (day/month/year) 07 November 1998 (07.11.98)	
Applicant MARCONI ELECTRONIC SYSTEMS LIMITED et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
- AU, JP, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
- CA EP

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 18 May 2000 (18.05.00) under No. WO 00/28475

**REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)**

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a **demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 18-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))**  
If the applicant wishes to enter the national phase, the following must be done:

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

<p>The International Bureau of WIPO  34, chemin des Colombettes  1211 Geneva 20, Switzerland</p> <p>Facsimile No. (41-22) 740.14.35</p> <p>Form PCT/IB/308 (July 1998)</p>	<p>Authorized officer</p> <p>J. Zahra</p> <p>Telephone No. (41-22) 338.83.38</p>
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## PATENT COOPERATION TREATY

PCT

NOTIFICATION CONCERNING  
SUBMISSION OR TRANSMITTAL  
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

HOSTE, Colin, Francis  
GEC Patent Dept.  
Waterhouse Lane  
Chelmsford  
Essex CM1 2QX  
ROYAUME-UNI

KREIGNS	PC
ITC	
28 DEC 1999	

Date of mailing (day/month/year) 01 December 1999 (01.12.99)	<b>IMPORTANT NOTIFICATION</b>
Applicant's or agent's file reference P/61459/MRCY	
International application No. PCT/GB99/03642	
International publication date (day/month/year) - Not yet published	
Applicant MARCONI ELECTRONIC SYSTEMS LIMITED et al	International filing date (day/month/year) 04 November 1999 (04.11.99)  Priority date (day/month/year) 07 November 1998 (07.11.98)

- The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
- An asterisk(\*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
- The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
07 Nove 1998 (07.11.98)	9824403.1	GB	24 Nove 1999 (24.11.99)

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Form PCT/IB/304 (July 1998)

Authorized officer

Marc Salzman

Telephone No. (41-22) 338.83.38

002984469

# PATENT COOPERATION TREATY

From the:  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:  
Hoste Colin F.  
MARCONI Int. Property  
Waterhouse Lane  
Chelmsford  
Essex CM1 2QX  
GRANDE BRETAGNE

RM RM.	
ITC	
4 AUG 2000	

## PCT

### WRITTEN OPINION

(PCT Rule 66)

Date of mailing (day/month/year)		10.08.2000
Applicant's or agent's file reference P/61459/MRCY		<b>REPLY DUE</b> within 3 month(s) from the above date of mailing
International application No. PCT/GB99/03642	International filing date (day/month/year) 04/11/1999	Priority date (day/month/year) 07/11/1998
International Patent Classification (IPC) or both national classification and IPC G06K19/07		
Applicant MARCONI ELECTRONIC SYSTEMS LIMITED et al.		

- This written opinion is the **first** drawn up by this International Preliminary Examining Authority.
- This opinion contains indications relating to the following items:
  - ☒ Basis of the opinion
  - ☐ Priority
  - ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - ☐ Lack of unity of invention
  - ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - ☐ Certain document cited
  - ☒ Certain defects in the international application
  - ☐ Certain observations on the international application
- The applicant is hereby **invited to reply** to this opinion.
 


**When?** See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

**How?** By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

**Also:** For an additional opportunity to submit amendments, see Rule 66.4.  
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.  
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.
- The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 07/03/2001.

Name and mailing address of the international preliminary examining authority:

 European Patent Office  
D-80298 Munich  
Tel. +49 89 2399 - 0 Tx: 523656 epmu d  
Fax: +49 89 2399 - 4465

Authorized officer / Examiner

Geiger, J-W

Formalities officer (incl. extension of time limits)

Slater, S

Telephone No. +49 89 2399 2565



## WRITTEN OPINION

International application No. PCT/GB99/03642

### I. Basis of the opinion

1. This opinion has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"*):

#### Description, pages:

1-11 as originally filed

#### Claims, No.:

1-12 as originally filed

#### Drawings, sheets:

1/2-2/2 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

### V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

#### 1. Statement

Novelty (N)	Claims no: 1, 4, 5, 6, 9, 12
Inventive step (IS)	Claims no: 2, 3, 7, 8, 10, 11
Industrial applicability (IA)	Claims

#### 2. Citations and explanations

see separate sheet

## **WRITTEN OPINION**

International application No. PCT/GB99/03642

### **VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

**see separate sheet**



**Preliminary Remark**

Reference is made to the following documents:

D1: US-A-4 786 903

D2: GB-A-2 284 323

D3\*: US-A-3 739 284

\* D3 was not cited in the international search report.  
A copy of the document is appended hereto.

**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**Claim 1 (independent)**

The subject-matter of claim 1 does not fulfill the requirements of novelty (Art. 33(2) PCT) because D1 discloses (the references in parentheses applying to this document)

a receiver circuit comprising

- ◆ an antenna (36; cf. fig. 1 and col. 3, lines 15 - 20) for receiving a modulated carrier signal;
- ◆ a transistor (34) connected to the antenna and configured to operate as a detector of modulation of the carrier signal (cf. col. 3, lines 49 - 68);
- ◆ a resonator circuit (36 - 42) connected to the transistor and configured such that the transistor can simultaneously oscillate at substantially the modulation frequency (cf. col. 2, lines 27 - 31);
- ◆ an oscillator quenching means (22) for periodically quenching oscillation of the transistor (cf. col. 3, lines 40 - 48) and means (14, 16) for sensing the characteristics of the built-up of oscillation to indicate the presence of a modulated carrier signal (cf. col. 3, line 66 to col. 4, line 26).

### **Claim 2**

The subject-matter proposed in claim 2 cannot be considered to involve an inventive step (Article 33(3) PCT) because D2 already discloses the features of claim 2 for indicating the presence of a modulated carrier signal received by using a similar circuit arrangement in a tag (see page 5, line 15 to page 6, line 1).

It would therefore be obvious to the person skilled in the art, to apply these features of the receiver circuit of D2 to D1, thereby arriving at a receiver circuit according to claim 2.

### **Claim 3**

The subject-matter proposed in claim 3 cannot be considered to involve an inventive step (Article 33(3) PCT) because the feature that the said selected magnitude is the point at which oscillator compression of the transistor occurs is merely one of several straightforward possibilities from which the skilled person would select without the exercise of inventive skill, to solve the problem of detecting the presence of a modulated carrier signal.

### **Claims 4, 5, 6, 9 and 12**

The subject-matter of the claims 4, 5, 6, 9 and 12 is not new and does not fulfill the requirements of Article 33(2) PCT because D1 discloses (the references in parentheses applying to this document)

- ♦ oscillator quenching means which quenches oscillation of the transistor at regular time intervals (cf. col. 3, lines 40 - 48) and means for sensing measures the magnitude of oscillation over one or more of the time intervals to indicate the presence of a modulated carrier signal (cf. col. 4, lines 13 - 14);

- ◆ that the transistor comprises a field effect transistor (fig. 1, part 34);
- ◆ that the oscillator quenching means quenches oscillations of the transistor by varying the drain source current (cf. col. 2, lines 32 - 48)
- ◆ that the resonator circuit comprises a network of one or more capacitors and inductors (cf. col. 2, lines 22 - 31)
- ◆ that a wake-up detector circuit includes a receiver circuit according to any of the claims 1 to 11 (cf. col. 1, lines 36 - 42)

#### **Claims 7 and 8**

The solution for building up a resonator circuit proposed in claim 7 and 8 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) because using ceramic resonators or quartz crystals in resonating circuits is a standard design choice.

#### **Claim 10**

The subject-matter proposed in claim 10 cannot be considered to involve an inventive step (Article 33(3) PCT) because D2 already employed a matching network between the antenna and the transistor (see fig. 1, part 3).

It would therefore be obvious to the person skilled in the art, to apply these features of the matching network of D2 to D1, thereby arriving at a receiver circuit according to claim 10.

#### **Claim 11**

The feature proposed in claim 11 cannot be considered as involving an inventive step (Article 33(3) PCT) because D3 (cf. col. 1, lines 65 - 68) discloses the use of narrow

**WRITTEN OPINION  
SEPARATE SHEET**

---

band filter for converting a frequency modulated signal to an amplitude modulated signal.

The skilled person would therefore regard it as a normal option to include this feature of D3 in the receiver circuit described in D1 in order to solve the problem of FM-AM conversation and thereby arriving at a circuit according to claim 11.

**Re Item VII**

**Certain defects in the international application**

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1, D2 and D3 is not mentioned in the description, nor is this document identified therein.

Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT.

The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).



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Applicant's or agent's file reference  
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PCT/GB99/03642

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Priority date (day/month/year)  
07/11/1998

Applicant

MARCONI ELECTRONIC SYSTEMS LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
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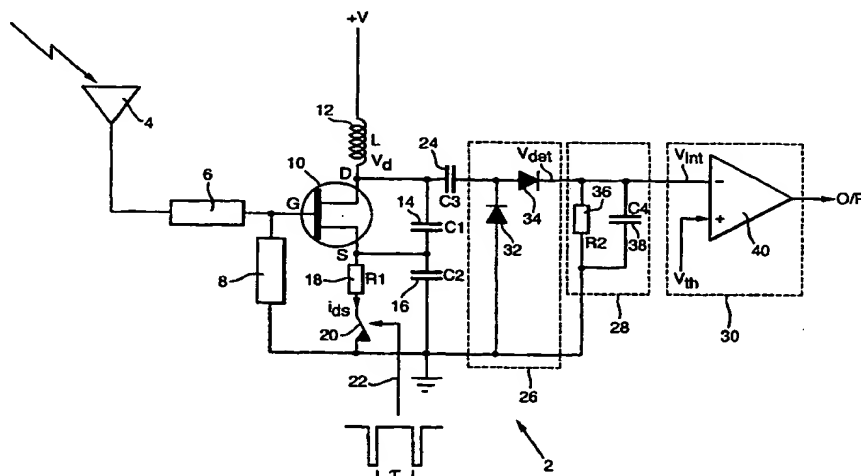
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(54) Title: A RECEIVER CIRCUIT



(57) Abstract

A detector receiver circuit (2) for use as a wake-up detector for detecting an amplitude modulated carrier signal is described. The circuit (2) comprises: an antenna (4) for receiving the modulated carrier signal; a transistor (10), such as an FET, is connected to the antenna (4) and configured to operate as a detector of modulation of the carrier frequency. The circuit further comprises a resonator circuit (12-16) which is also connected to the transistor and configured such that the transistor (10) can simultaneously oscillate at substantially the modulation frequency; an oscillator quenching means (20) for periodically quenching oscillation of the transistor (10) and means (26, 28, 30) for sensing the characteristics of the build-up of oscillation to indicate the presence of a modulated carrier signal. How quickly the magnitude of oscillation of the transistor (10) builds up is dependent on whether the antenna is receiving a carrier signal which is modulated at the frequency of self-oscillation of the transistor and this is utilised to detect for the presence of a valid wake-up signal.

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A RECEIVER CIRCUIT

This invention relates to a receiver circuit and more especially, although not exclusively, to such a receiver circuit for use as a "wake-up" detector for a tag.

Tagging systems are well known and generally comprise at least one interrogator circuit  
5 which is connected to a control centre by means of a telecommunications network and  
a number of tags, which include a transponder circuit, with which the interrogator circuit  
can communicate typically by means of radio transmission. Generally, an interrogator  
circuit is at a fixed location whilst the tags are attached to objects which are mobile. The  
applications for tagging systems are numerous and include road tolling systems; remote  
10 reading of utility meters such as electricity, water or gas consumption meters; telematics  
(that is communication between an infrastructure and vehicles) and logistics (that is  
keeping track of the movement of goods such as food between a warehouse and a number  
of retail outlets) to name but a few.

15 In a number of applications, the tag will be inoperative for a significant proportion of the  
time. For example, the tag may only be required to communicate with the interrogator  
for a few minutes, or even seconds, over a period of many months or even years. To  
reduce the power consumption of the tag and hence increase the operating life of the tag,  
which will often be operated from a battery supply, it has been proposed that the tag has  
20 a second mode of operation, often termed a "sleep" mode or low current state. In this low  
current state the power consumption of the tag is kept to a minimum by switching off all  
non-essential circuitry. The tag is re-activated or awoken from its "sleep" state when it

detects a recognised signal, often termed a "wake-up" signal, from the interrogating source. For tags which operate at microwave frequencies it is known for the wake-up signal to be in the form an amplitude modulated (AM) microwave signal. The detector modulator circuit of the tag's transponder circuit will act as an efficient microwave  
5 detector at very low bias currents, even of the order of a few micro-amps, enabling detection of the wake-up signal. However, the tag will often include additional circuitry such as a microprocessor which is required to operate at a logic level of the order of a few volts. In order to convert the very low detected microwave signal to an appropriate level to activate a microprocessor, it is known to use an amplifier and comparator between the  
10 detector and the microprocessor. Depending on the frequency of the wake-up signal, the amplifier and comparator can consume a significant amount of electrical power, of the order of  $50\mu\text{A}$ , and these components can represent a significant part of the overall cost of the tag.

15 For tagging systems in which a slow wake-up is acceptable, a low frequency wake-up signal can be used. In such systems it is possible to use an amplifier which has an adequate gain bandwidth product and which is able to operate at very low currents, (of the order of  $5\mu\text{A}$ ). Such amplifiers however tend to be prohibitively expensive in many applications. Conversely for systems in which a fast wake-up response is required or for  
20 systems where a low frequency wake-up tone is not available or viable, such as those based on emerging standards for telematics, the required gain bandwidth product of the amplifier results in a circuit which has a significant power consumption (of the order of  $50\mu\text{A}$ ). Combined with the significant cost of these amplifiers this type of circuit virtually rules out long life operation from a battery.

The use of wake-up detectors is also known in applications other than tagging systems such as for example in the handsets of cellular telephones or in digital cordless telephones. Whilst for such applications cost is not such an overriding issue an inexpensive detector receiver circuit could be of benefit. A need exists therefore for a  
5 receiver circuit which is both inexpensive and which has a low power consumption.

The present invention has arisen in an endeavour to provide a receiver circuit which can be used as a wake-up detector and which at least in part overcomes the problems of the known arrangements.

10

According to the present invention a receiver circuit comprises: an antenna for receiving a modulated carrier signal; a transistor connected to the antenna and configured to operate as a detector of modulation of the carrier signal; a resonator circuit connected to the transistor and configured such that the transistor can simultaneously self-oscillate  
15 at substantially the modulation frequency; an oscillator quenching means for periodically quenching self-oscillation of the transistor and means for sensing the characteristics of the build-up of oscillation to indicate the presence of a modulated carrier signal.

How quickly the magnitude of oscillation of the transistor builds up is determined by  
20 whether the antenna is receiving a carrier signal which is modulated at the selected modulation frequency. It will be appreciated therefore that the transistor simultaneously operates as a detector of the modulation of the carrier and as a super-regenerative receiver at the modulation frequency of this carrier. By configuring the transistor to simultaneously operate in the two modes of operation, the circuit thus provides an

extremely sensitive receiver circuit which is both inexpensive and has a very low power consumption.

In one arrangement of the circuit, the oscillator quenching means quenches oscillation  
5 of the transistor when the magnitude of oscillation reaches a selected magnitude and the  
means for sensing measures the time between quenching of the transistor to indicate the  
presence of a modulated carrier signal. For example, when the circuit receives a carrier  
signal modulated at, or substantially the same as, the frequency of self-oscillation of the  
circuit, the time taken to reach the selected magnitude will decrease and this can be  
10 detected as an increase in the quenching frequency. Preferably the selected magnitude  
is the point at which oscillator compression of the transistor occurs, that is the point at  
which saturation of the amplitude of the oscillation of the transistor occurs.

In an alternative embodiment, the oscillator quenching means quenches oscillation of the  
15 transistor at regular time intervals and the means for sensing measures the magnitude of  
oscillation over one or more of the time intervals to indicate the presence of a modulated  
carrier signal. Conveniently the time interval is selected such that in the absence of a  
modulated signal the magnitude of oscillation will not reach a selected threshold value  
and will exceed this threshold when a modulated carrier signal is present. Alternatively  
20 the average magnitude of oscillation over one or more time intervals can be used to  
indicate the presence of a modulated carrier signal.

In a particularly preferred embodiment, which is for use at microwave frequencies, the  
transistor comprises a field effect transistor (FET) and the oscillator quenching means,

which conveniently comprises a switching means, quenches oscillation of the transistor by varying the drain source current of the FET. Conveniently with such a circuit, the resonator circuit comprises a ceramic resonator, a quartz crystal or a network of one or more capacitors and inductors. Since all of these components are essentially passive elements, this ensures the circuit remains simple and inexpensive to manufacture.

Advantageously, the receiver circuit further comprises a matching network between the antenna and the transistor. To enable the circuit to operate with a frequency modulated (FM) or phase modulated carrier signal, the circuit further comprises a narrow band filter for converting the frequency/phase modulated signal to an amplitude modulated signal before it is applied to the input of the transistor.

According to a further aspect of the invention, a wake-up detector circuit includes a receiver circuit as described above.

In order that the invention may be further understood, an embodiment thereof will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a schematic of a receiver circuit in accordance with the invention; and

Figure 2 is a representation of the voltage (i)  $v_d$  at the drain d of field effect transistor, (ii)  $v_{det}$  at the detector's output and (iii)  $v_{int}$  at the output of the integrator versus time for the circuit of Figure 1, (a) in the absence of a modulated signal and (b) when the antenna

receives a modulated signal.

Referring to Figure 1, there is shown a receiver or wake-up circuit 2 in accordance with the invention for operation with a carrier frequency of 2.45 GHz. The circuit 2 comprises  
5 a patch antenna 4 which is connected by means of a radio frequency (rf) matching network 6, 8 to the gate g of a field effect transistor (FET) 10. In the example shown the FET 10 is a gallium arsenide FET, ATF21186A. The matching network 6, 8 comprises a microstrip line arrangement which matches the input impedance of the FET 10 to that of the antenna 4 and provides a dc/low frequency ground for the gate g of the FET 10.  
10 The matching network is configured such that the FET 10 will operate as a receiver at 2.45 GHz.

A resonator circuit which comprises a serially connected inductor 12 (L) and two capacitors 14 ( $C_1$ ) and 16 ( $C_2$ ) is provided between the positive supply rail + V and earth  
15 with the node between the inductor 12 and capacitor 14 being connected to the drain d of the FET 10 and the node between the two capacitors 14 and 16 being connected to the source s of the FET 10. The values of the inductor 12 and capacitors 14 and 16 are selected such that the FET 10 will self-oscillate at a selected frequency; in the example described, 100 kHz. The selected frequency, which will be termed the wake-up  
20 frequency, corresponds to the expected frequency of modulation of the 2.45 GHz carrier signal. The modulated signal will be termed the wake-up signal.

Between the source of the FET 10 and ground there is provided a serially connected resistor 18 ( $R_1$ ) and switch 20. The resistor 18 sets the dc operating conditions of the

FET 10 and its value is selected such that when the switch is "closed" the FET 10 operates as a negative resistance. In such a condition the gain of the FET 10 exceeds the loss resistance of the tuned resonator circuit 12, 14, 16 and the transistor self-oscillates. The state of the switch 20, that is whether it is "open" or "closed" circuit, is controlled by a control input 22 to which a pulsed signal of time period  $\tau$  is applied. The switch 20 thus controls the current  $i_{ds}$  flowing between the drain and source of the FET 10 and hence whether the transistor can self-oscillate.

Connected to the drain of the FET 10 via a coupling capacitor 24 ( $C_3$ ) are a serially connected detector circuit 26, an integrator circuit 28 and a threshold detector circuit 30. As is known the coupling capacitor 24 allows high frequency signals to pass whilst ensuring the detector circuit 26 does not affect the DC bias conditions of the FET 10.

As shown, the detector circuit 26 is a voltage doubling diode detector comprising two Schottky diodes 32 and 34; the integrator circuit 28 consists of a parallel connected resistor 36 ( $R_2$ ) and capacitor 38 ( $C_4$ ) and the threshold detector 30 consists of a voltage comparator 40 for comparing the voltage  $v_{int}$  at the output of the integrator 28 with a threshold voltage  $V_{th}$ . The values of the resistor 36 and capacitor 38 are selected to ensure the time constant of the integrator is such that it produces the envelope of the voltage  $V_{det}$  appearing at the output of the detector 26.

As described the FET 10 is configured by the matching circuit 6 and 8 to operate as a receiver at 2.45 GHz and is simultaneously configured by the series resonator circuit 14, 16 and 18 to operate as an oscillator at the 100 kHz modulation frequency. In operation,

oscillation of the transistor is quenched periodically by quenching the drain/source current  $i_{ds}$  whenever the switch 20 is open circuit and the circuit is allowed to restart oscillating for time interval  $\tau$ . The time taken for the magnitude of oscillation to build up once it has been quenched is dependent on the Q factor of the tuned resonator circuit

5 12, 14, 16, the gain of the FET 10 and, most importantly, whether a modulated carrier signal is present at the gate g of the FET 10.

Referring to Figure 2(a)i-iii these figures show the voltage appearing at various points in the circuit in the absence of a wake-up signal. From Figure 2(a)i it will be seen how  
10 the voltage  $v_d$  appearing at the drain d builds up as the transistor begins to self-oscillate. After a period of time  $\tau$  the switch 20 opens and oscillation of the transistor is quenched. After a short period the switch is closed for a further time period  $\tau$  and the transistor begins to self oscillate once more before being quenched and this process is repeated. Referring to Figures 2(a) ii and iii, these show the corresponding rectified voltage  $v_{det}$  at  
15 the output of the detector circuit 26 and the voltage  $v_{int}$  at the output of the integrator 28, the latter of which corresponds to the envelope the voltage  $v_{int}$ . The time period  $\tau$  and/or the Q factor of the tuned resonator circuit are selected such that in the absence of a wake-up signal the voltage  $v_{int}$  is always less than the threshold voltage  $V_{th}$ .

20 Referring to Figure 2(b)I - iii these show the equivalent voltage plots for the case when the circuit 2 receives a wake-up signal at the antenna 4. As will be apparent the magnitude of oscillation builds up much more rapidly and the voltage  $v_{int}$  soon exceeds the threshold voltage  $V_{th}$  causing the output of the voltage comparator 40 to change state indicating the detection of a wake-up signal. The output from the voltage comparator can



be used directly to re-activate circuitry, such as a microprocessor, which has been previously set into a sleep state to reduce power consumption. Having detected a valid wake-up signal, the circuit 2 can be readily re-configured to operate as the transponder circuit of a tag by switching the resonator circuit 12, 14, 16 out of the circuit 2 and  
5 changing the drain/source current as for example is described in our UK Patent No GB 2284323.

It will be appreciated therefore that the FET 10 functions as a low frequency (100 kHz) super-regenerative receiver of amplitude modulation of a microwave (2.4 Ghz) signal.

10 It is found that the circuit 2 described is capable of operation at extremely low currents, of the order of two microamps, but is still able to produce a large output change which can be used to directly drive logic circuits. Furthermore the circuit is also inexpensive since the transistor is configured to operate as both a microwave detector and an oscillator at the modulation frequency. The circuit thus allows a low power wake-up  
15 detector to be produced which is capable of operating with relatively high modulated frequency wake-up signals with a very high degree of sensitivity. The nature of the circuit configuration is such that it has an inherent filtering effect which reduces false wake-up events.

20 It will be appreciated that modifications to the circuit illustrated may be made within the scope of the present invention. For example, in the embodiment illustrated, oscillation of the transistor is quenched at regular intervals and the threshold detector circuit determines when a modulated signal is present when the magnitude of oscillation exceeds the threshold voltage within a given time interval. In a further embodiment of the

invention the time constant of the integrator is selected such that the voltage is integrated over a number of time intervals to give a measure of the average value of the magnitude of oscillation. Such an arrangement provides an even higher noise immunity and tolerance to false triggering though the wake-up time will accordingly be increased. In yet a further embodiment oscillation of the transistor is quenched whenever it reaches a selected magnitude of oscillation and the time between quenching events is used to detect for the presence of the selected wake-up signal. In all embodiments the characteristics of the build-up of oscillation is used to indicate the presence of a modulated carrier signal.

10

It will be further appreciated that the invention is not limited to the specific circuit arrangement described. For example, in an alternative embodiment the integrator and threshold detector 30 could be replaced with a Schmitt logic gate in which the threshold voltage corresponds to the logic level of the gate. With such an arrangement the logic gate will produce a clocked output, at the modulation required, which can be used to clock a microprocessor or other control circuitry. Once a valid wake-up signal is detected, the processor then inhibits quenching of the transistor and the circuit will continue to provide a clock signal whilst a modulated carrier signal is being received. A particular advantage of this arrangement is that the microprocessor can be clocked externally without the need of an internal clock.

20

In further embodiments of the invention, the series resonator circuit can be replaced with a low frequency crystal which would very precisely set the frequency oscillation of the circuit and give even better sensitivity or with a ceramic resonator or other forms of

resonator circuits which comprise one or more capacitors and inductors. Depending on the frequency of operation, the FET 10 could be replaced with other types of transistors such as bipolar devices and likewise the patch antenna by an antenna appropriate to the desired frequency of operation. The term transistor is intended to have a broad meaning  
5 and include both discrete devices and those that are a part of a larger integrated circuit.

Furthermore, whilst the receiver circuit 2 has been described in relation to a wake-up detector for a tag, the circuit can be used in other applications. One example is to use it in the handset of a digital cordless telephone which uses burst mode transmission such  
10 as Time Division Multiple Access (TDMA). In such an application the transistor is tuned to operate as a receiver at the carrier frequency and is configured to self-oscillate at the frequency of the bursts (i.e. the reciprocal of the time interval between bursts). The present invention thus provides a very low power receiver circuit which has a fast response and which can detect high frequency burst mode signal such as for example  
15 those used in cellular telephones. One further example of an application of the invention is in the detection of TDMA signals particularly those from cellular phones in areas, such as railway carriages, where the use of such equipment is prohibited. Furthermore it will be appreciated that the circuit is also suited to use with a frequency or phase modulated carrier signals provided a narrow band filter is used to convert the received signal to an  
20 AM modulated signal before it is applied to the input of the transistor.

CLAIMS

1. A receiver circuit (2) comprising:
    - an antenna (4) for receiving a modulated carrier signal;
    - a transistor (10) connected to the antenna and configured to operate as a detector of modulation of the carrier signal;
    - a resonator circuit (12-16) connected to the transistor and configured such that the transistor can simultaneously oscillate at substantially the modulation frequency;
    - an oscillator quenching means (20) for periodically quenching oscillation of the transistor and means (26, 28, 30) for sensing the characteristics of the build-up of oscillation to indicate the presence of a modulated carrier signal.
  2. A receiver circuit according to Claim 1 in which the oscillator quenching means (20) quenches oscillation of the transistor when the magnitude of oscillation reaches a selected magnitude and the means for sensing measures the time between quenching of the transistor to indicate the presence of a modulated carrier signal.
  3. A receiver circuit according to Claim 2 in which the selected magnitude is the point at which oscillator compression of the transistor occurs.
  4. A receiver circuit according to Claim 1 in which the oscillator quenching means quenches oscillation of the transistor at regular time intervals, and the means for sensing measures the magnitude of oscillation over one or more of the time intervals to indicate
-

the presence of a modulated carrier signal.

5. A receiver circuit according to any preceding claim wherein the transistor comprises a field effect transistor (FET).
6. A receiver circuit according to Claim 5 wherein the oscillator quenching means quenches oscillation of the transistor by varying the drain source current.
7. A receiver circuit according to any preceding claim in which the resonator circuit comprises a ceramic resonator.
8. A detector receiver circuit according to any one of Claims 1 to 6 in which the resonator circuit comprises a quartz crystal.
9. A detector receiver circuit according to any one of Claims 1 to 6 in which the resonator circuit comprises a network of one or more capacitors and inductors.
10. A receiver circuit according to any preceding claim and further comprising a matching network between the antenna and transistor.
11. A receiver circuit according to any preceding claim for use with a frequency or phase modulated carrier signal and further comprising a narrow band filter for converting the frequency or phase modulated signal to an amplitude modulated signal before it is applied to the input of the transistor.

12. A wake-up detector circuit including a receiver circuit according to any preceding claim.

Fig.1.

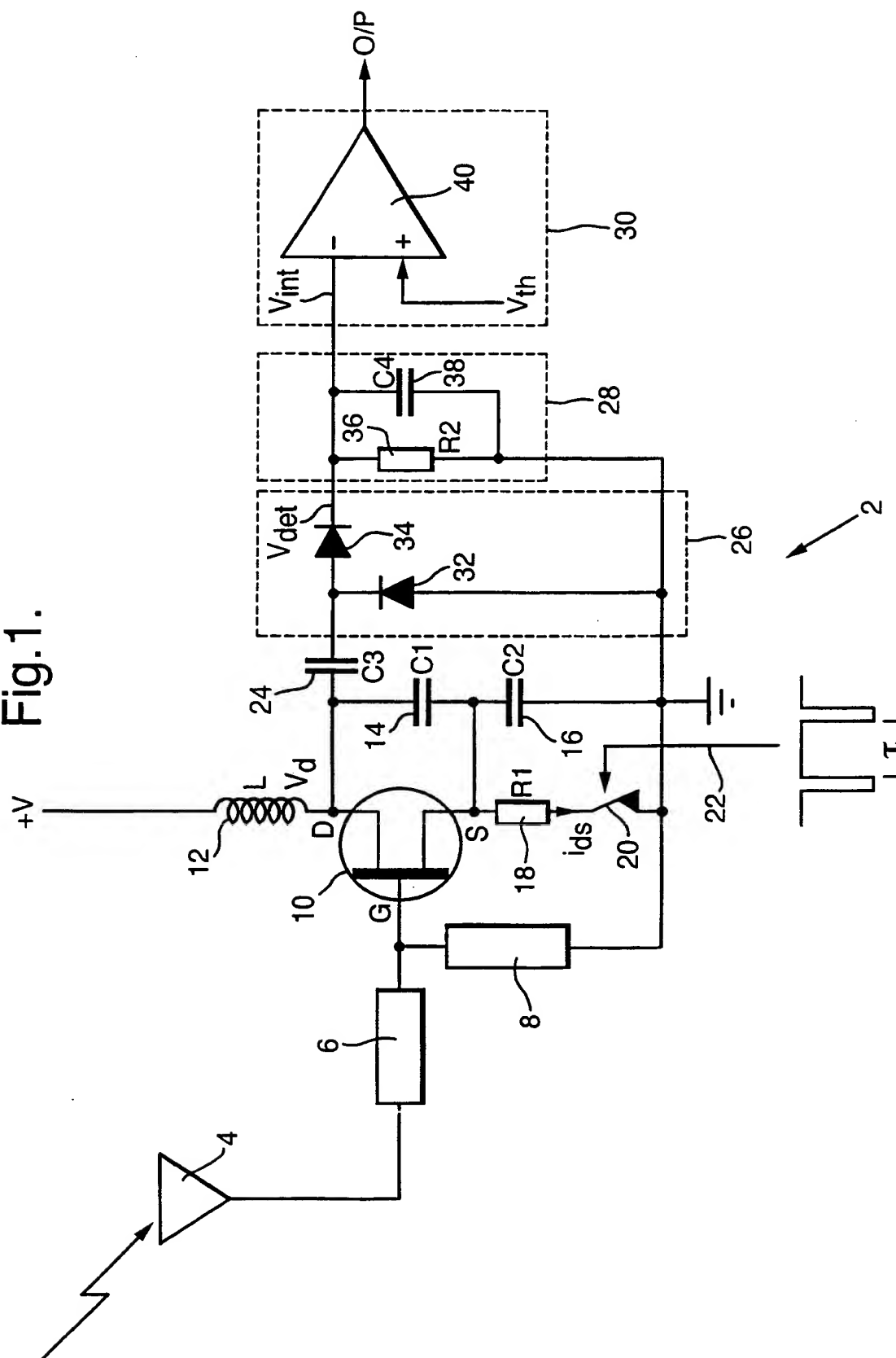


Fig.2(a).

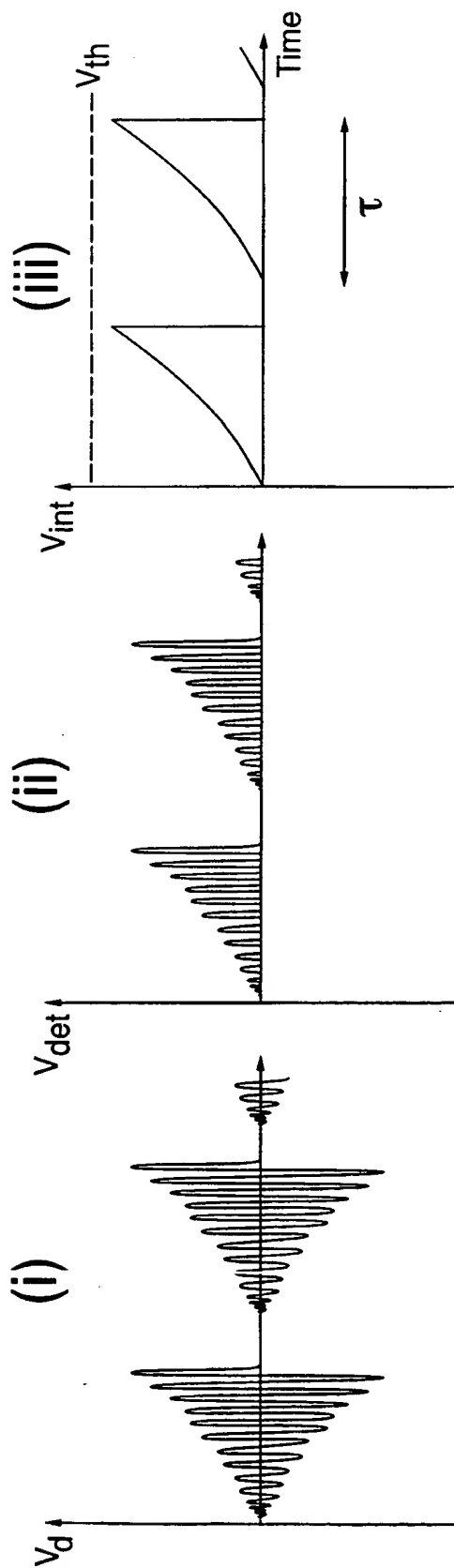
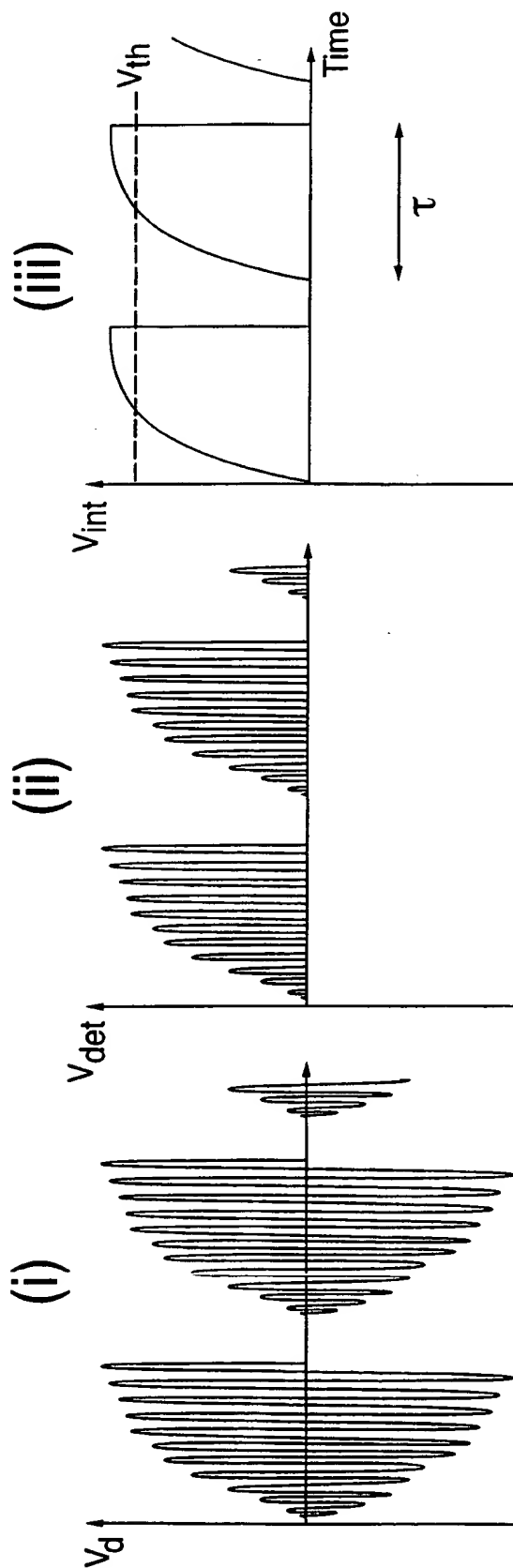


Fig.2(b).





# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/03642

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 G06K19/07 G01S7/35 G01S13/76

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06K G01S H03D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 786 903 A (GRINDAHL MERVIN L ET AL) 22 November 1988 (1988-11-22) abstract column 2, line 12 -column 4, line 68 figures 1,2 ---	1,4-6,9, 10,12
X	GB 2 284 323 A (MARCONI GEC LTD) 31 May 1995 (1995-05-31) cited in the application abstract page 1, line 1 -page 3, line 20 page 5, line 15 -page 6, line 9 figures 1,3,4 ---	1,5,6,9, 10,12
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Date of the actual completion of the international search

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/03642

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 871 042 A (GORDIAN HOLDING CORP) 14 October 1998 (1998-10-14) abstract column 1, line 3 -column 4, line 18 ---	7,8
A	US 3 983 487 A (OHNO MASA HARU) 28 September 1976 (1976-09-28) abstract ---	11
A	EP 0 467 036 A (SAVI TECHN INC) 22 January 1992 (1992-01-22) abstract column 3, line 35 -column 6, line 46 -----	12

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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